Direct Numerical Simulation of Pluto's Extended Atmosphere

J. V. Austin, D. B. Goldstein (University of Texas)

The structure and escape of Pluto's upper atmosphere is modeled using the Direct Simulation Monte Carlo (DSMC) method. Several atmospheric compositions are studied consisting primarily of N_2 with differing mixing fractions of CH_4 and CO. Radial profiles of temperature, density and species distributions are calculated in a spherically symmetric domain with a varying gravitational body force. Lower boundary conditions are obtained from a hydrostatic, radiative model of Pluto's lower atmosphere (Strobel *et al.* 1996) and results for pure methane are compared against Trafton's hydrodynamic, extended atmosphere model (Trafton *et al.* 1987, 1989 and Clarke *et al.* 1992). Using the DSMC approach the atmosphere is modeled statistically by extrapolating from the motions and collisions of a relatively small number of representative molecules. This method can solve fully viscous, compressible, unsteady flow problems and allows for rarefied and non-LTE effects and the diffusive separation of multi-species gases.

Abstract submitted for 1996 DPS meeting

Date submitted: LPI electronic form version 5/96

Division for Planetary Sciences Abstract Form

DPS Category 22 Running #7480 Session 0.00

Invited ☐ Poster presentation ☒ Title only ☐

Have you received your Ph.D. since the last DPS meeting?

Yes ☐ No ☒

Is your abstract newsworthy, and if so, would you be willing to prepare a news release and be available for interviews with reporters?

Yes ☐ No ☒ Maybe ☐

Paper presented by J. Victor Austin
Center for Aeromechanics Research
Aerospace Engineering Department
The University of Texas at Austin
Austin TX 78712 USA
Phone: 512-471-7558
Fax: 512-471-3788
Email: victor@cfdlab.ae.utexas.edu

Special instructions: Tue Aug 27 16:50:54 CDT 1996

Membership Status (First Author):

DPS-AAS Member ☐ Non-Member ☐

Student Member ☐ Student Non-Member ☒

Is this your first DPS presentation? Yes ☒ No ☐

Sponsor: Laurence M. Trafton